



Original article

## Cardiovascular disease in patients with type 1 and type 2 diabetes in Spain<sup>☆</sup>



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### ABSTRACT

**Background and objective:** To describe the prevalence of cardiovascular disease (CVD) in type 1 diabetes (T1DM) and to compare it with that observed in type 2 diabetes (T2DM) and normal population in Spain. **Patients and methods:** Cross-sectional study (18–70 years-old). Information on CVD was available from a nurse-administered questionnaire (Di@bet.es Study, NORMAL = 3430, T2DM = 312) and from a physician reporting form (T1DM = 1382). Differences in the crude and adjusted prevalence of coronary heart (CHD), cerebrovascular (CNSD), peripheral vascular (PVD) and overall CV (CVD) disease were investigated between T1DM vs. NORMAL, and T1DM vs. T2DM groups.

**Results:** We found differences in age, body mass index, proportion of women, dyslipemia and antihypertensive medication between T1DM vs. NORMAL and T1DM vs. T2DM (all  $p < .001$ ). Smoking prevalence was not different between T1DM vs. T2DM and it was lower in T1DM compared to NORMAL ( $p < .0001$ ). The percentage of CHD, CNSD, PVD, and overall CVD in T1DM vs. NORMAL was 3.0 vs. 2.5 ( $p = .31$ ), 0.70 vs. 1.10 ( $p = .22$ ), 2.61 vs. 0.20 ( $p < .0001$ ), and 5.1 vs. 3.44 ( $p < .01$ ), respectively. The prevalence in T2DM (vs. T1DM) was 11.3 ( $p < .0001$ ), 3.5 ( $p < .0001$ ), 4.2 ( $p = .13$ ), and 17% ( $p < .0001$ ), respectively. Multiple logistic regression adjusted models showed a higher prevalence of CHD (odds ratio [OR] 2.27, 95% confidence interval [95% CI] 1.41–3.67), PVD (OR 15.35, 95% CI 5.61–42.04), and overall CVD (OR 2.32, 95% CI 1.55–3.46), but not for CNSD (OR 0.49, 95% CI 0.19–1.27) in T1DM compared to NORMAL. No differences were found between T1DM and T2DM.

**Conclusions:** We found a higher prevalence of CVD in a Mediterranean population of T1DM individuals compared with non-diabetic subjects. This prevalence was similar to that observed in T2DM.

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## Enfermedad cardiovascular en pacientes con diabetes mellitus tipo 1 y tipo 2 en España

### RESUMEN

#### Palabras clave:

Diabetes mellitus tipo 1

Diabetes mellitus tipo 2

Enfermedad coronaria

Enfermedad cerebrovascular

Enfermedad vascular periférica

**Fundamento y objetivo:** Describir la prevalencia de enfermedad cardiovascular (ECV) en la diabetes mellitus tipo 1 (DM1) y compararla con la observada en personas con diabetes tipo 2 (DM2) o sin ella, en España.

**Pacientes y método:** Estudio transversal en sujetos de edad comprendida entre 18-70 años. La prevalencia de ECV se obtuvo mediante un cuestionario dirigido por una enfermera (Estudio Di@bet.es, NORMAL = 3.430, DM2 = 312) o un registro cumplimentado por médicos (DM1 = 1.382). Se evaluaron las diferencias no ajustadas y ajustadas de enfermedad coronaria (EC), cerebrovascular (ECEV), vascular periférica (EVP), y ECV global de DM1 frente a NORMAL y DM1 frente a DM2.

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**Resultados:** Hubo diferencias en edad, índice de masa corporal, porcentaje de mujeres, dislipidemia y tratamiento hipotensor entre DM1 frente a NORMAL y DM1 frente a DM2 (todos  $p < 0,001$ ). El tabaquismo fue similar entre DM1 y DM2, y menor en DM1 frente a NORMAL ( $p < 0,0001$ ). El porcentaje de EC, ECEV, EVP y ECV global en DM1 frente a NORMAL fue de 3,0 frente a 2,5 ( $p = 0,31$ ), 0,70 frente a 1,10 ( $p = 0,22$ ), 2,61 frente a 0,20 ( $p < 0,0001$ ) y 5,10 frente a 3,44 ( $p < 0,01$ ), respectivamente. El porcentaje en DM2 (frente a DM1) fue de 11,3 ( $p < 0,0001$ ), 3,5 ( $p < 0,0001$ ), 4,2 ( $p = 0,13$ ) y 17% ( $p < 0,0001$ ), respectivamente. La regresión logística múltiple ajustada mostró una mayor prevalencia de EC (*odds ratio* [OR] 2,27, intervalo de confianza del 95% [IC 95%] 1,41–3,67), EVP (OR 15,35, IC 95% 5,61–42,04), y ECV global (OR 2,32, IC 95% 1,55–3,46), pero no de ECEV (OR 0,49, IC 95% 0,19–1,27) en DM1 frente a NORMAL. No encontramos diferencias entre DM1 y DM2.

**Conclusiones:** Los pacientes con DM1 de un área mediterránea presentan mayor prevalencia de ECV que una población control, y similar prevalencia que pacientes con DM2 tras ajustar por factores de confusión.

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## Introduction

The clinical manifestations associated with cardiovascular disease (CVD) represent the leading cause of morbidity and mortality in patients with diabetes.<sup>1,2</sup> Most of this information comes mainly from studies conducted in people with type 2 diabetes mellitus (DM2).<sup>3</sup> Type 1 diabetes mellitus (DM1), by comparison, is much less common and affects a younger population. However, although the classic cardiovascular risk factors (CVRFs) that are present in DM2 have a lower prevalence in patients with DM1, the age-adjusted relative risk of CVD in these patients is greater than in patients with DM2, and 4–8 times greater than in the general population in the majority of studies.<sup>4–6</sup> An analysis performed in the United Kingdom calculated the risk of CVD among patients with DM1 between 45 and 55 years of age as similar to that observed in subjects without diabetes and 15–20 years older.<sup>6</sup> However, the information in this regard available in Spain is very limited.

The objective of our study was to report the prevalence and type of CVD present in adult patients with DM1 enrolled in a compulsory Catalan regional registry—the Catalan Public Registry of Continuous Subcutaneous Insulin Infusion Devices (RPC-ISCI)—of patients who start treatment with a continuous subcutaneous insulin infusion device. More important than this was to compare this prevalence with that observed, on the one hand, in people without diabetes and, on the other hand, in people with a known diagnosis of DM2. The latter came from a nationwide Spanish population-based study conducted from 2009 to 2010 in a sample representative of all of Spain (Di@bet.es study).

## Materials and methods

Adults between the ages of 18 (the lower age limit for the Di@bet.es study) and 70 (the age of the oldest patient from the RPC-ISCI registry) were enrolled in this cross-sectional, observational study. The information for patients with DM1 was obtained from the RPC-ISCI and collected from 1990 to 2010. The information for control subjects without diabetes (NORMAL) and with DM2 was obtained from the Di@bet.es study, a nationwide Spanish population-based study conducted from 2009 to 2010. Briefly, the RPC-ISCI is a Catalan regional registry of patients with DM1 at the start of treatment with a continuous subcutaneous insulin infusion device. Only adult individuals (18–70 years of age) were screened from this registry. The Di@bet.es study is a population-based, cross-sectional study conducted from 2009 to 2010, with a sample (cluster sampling) representative of all of Spain. Its main

objective was to determine the prevalence of diabetes and other CVRFs in Spain.<sup>7</sup> Participants without known diabetes were classified (WHO 2009) into different categories of glucose metabolism (unknown diabetes, prediabetes and no abnormalities [NORMAL]) by means of a fasting blood test and an oral glucose tolerance test. For this study, those individuals with known DM2 or NORMAL status were screened for this analysis. Information was obtained from both registries on the prevalence of coronary heart disease (CHD), cerebrovascular disease (CeVD), peripheral vascular disease (PVD) and the sum of the 3 (CVD). In the first registry (RPC-ISCI), the data on CVD came from information encoded and entered by physicians. The data on the prevalence of CVD in any of its forms of presentation in the Di@bet.es study came from a standardised questionnaire administered by a nurse responsible for the field work of the study.

In addition, clinical information was available on participants' age, sex, body mass index (BMI), tobacco use, duration of diabetes (if present), presence of dyslipidaemia or hypertension and history of receiving hypotensive treatment. Similarly, participants' last glycosylated haemoglobin (HbA1c) level before their enrolment in the registry, as well as the number of subjects with microangiopathic complications and their type, were available, although only for the DM1 group.

## Statistical analysis

The data are shown as a median (interquartile range) or number of people (proportions). A comparison between groups in terms of age, sex, BMI, tobacco use, duration of diabetes and CVD prevalences were performed by means of the chi-squared test or the Wilcoxon test for continuous variables with a non-normal distribution. The differences between DM1 vs. NORMAL and DM1 vs. DM2, in response to the proposed objectives, in the presence of age- and sex-adjusted CVD, and other CVRFs (and time of evolution of diabetes in DM1 vs. DM2), were evaluated by means of multiple logistic regression models and expressed as odds ratios (ORs) and 95% confidence intervals (95% CIs). Given the known differences in terms of sex in the prevalence of CVD, an analysis stratified by sex was performed.<sup>8</sup> A  $p < 0,05$  was considered to be statistically significant. Statistical analysis was performed using the SAS software program, ver. 9.2 (SAS Institute Inc., Cary, NC, United States).

## Results

A total of 1382 patients with DM1 were enrolled from the RPC-ISCI registry (Table 1). Among them, repeated

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